Remarks

Reconsideration of the application and allowance of all claims pending are respectfully requested. Claims 1-25 are pending.

Claim Rejections - 35 U.S.C. § 103

Claims 1-25 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Vengsarkar (U.S. Patent No. 5,430,817) in view of Orthonos et al. (Artech House, Inc., 1999; "Orthonos") and in further view of Goldberg et al. (U.S. Patent No. 6,731,837; "Goldberg") and Michal et al. (U.S. Patent No. 6,025,915; "Michal"). This rejection is respectfully, but most strenuously, traversed.

Applicant respectfully submits that the Office Action's citations to the applied references, with or without modification or combination, assuming, *arguendo*, that the modification or combination of the Office Action's citations to the applied references is proper, do not teach or suggest one or more elements of the claimed invention, as further discussed below.

For explanatory purposes, applicant discusses herein one or more differences between the Office Action's citations to the applied references and the claimed invention with reference to one or more parts of the applied references. This discussion, however, is in no way meant to acquiesce in any characterization that one or more parts of the Office Action's citations to the applied references correspond to the claimed invention.

Applicant respectfully submits that the Office Action's citations to the applied references do not teach or suggest the long period Bragg grating that attenuates the one or more output signals, as recited in applicant's independent claim 1.

Vengsarkar (column 3, lines 22-47; FIG. 5) discloses a long period spectral shaping device to remove unused pump energy:

> FIG. 5 illustrates an optical transmission system 50 using a long period spectral shaping device to remove unused pump energy. Specifically, the system 50 comprises a transmitter source 51 of optical signals such as a digitally modulated 1.55 μm signal, an optical signal path comprising a length of optical fiber 52 for transmitting the signal, and a receiver 53 for receiving and demodulating the signal. An optical amplifier such as an erbium-doped fiber amplifier 54 is disposed in the optical signal path for amplifying the transmitted signal. The amplifier is pumped by pump sources 55, 56 of optical energy of pump wavelengths λp_1 and λp_2. Unused pump energy of each pump wavelength will pass through amplifier 54. The energy is advantageously removed from the system so that it will not deteriorate the performance of the pump sources 55, 56 and transmission and receiving equipment 51, 53. To remove unused pump energy, a long period spectral shaping device 57 is disposed in the path of the energy from pump 55 after it has passed through amplifier 54. Specifically, in the dual-pumped laser of FIG. 5, device 57 has its spacing Λ chosen to remove energy of wavelength λp_1. A second long period grating 58 has its spacing chosen to remove energy of wavelength λp_2. In a typical application, λ_s is 1.55 μm, λ_{p1} is 9.780 μm and λ_{p2} is 9.840 μm.

Vengsarkar discloses removal of unused *pump energy* of wavelength λ_{p1} and λ_{p2} by the devices 57 and 58, respectively. Vengsarkar fails to disclose removal of *output energy* from the amplifier 54 directed towards the pump source, for example, output energy of wavelength λ_s, through employment of a long period Bragg grating.

Orthonos discloses known characteristics of long period Bragg gratings. Orthonos fails to disclose a long period Bragg grating that attenuates output signals from an amplification fiber directed towards a light source.

Goldberg discloses fusion splicing for low loss coupling of optical fiber. Goldberg fails to disclose a long period Bragg grating that attenuates output signals from an amplification fiber directed towards a light source.

Michal (column 4, lines 38-59) discloses:

> The gain fiber 218 absorbs part of the pump light and emits light propagating lengthwise in both directions in the gain fiber.

> Light emitted in the direction of propagation of the pump light is referred to as forward light. Light emitted by the gain fiber 218 in the direction opposite to the direction of propagation of the pump light is referred to as reverse light. The broadband optical signal source 202 may be formed with either a single-pass or double-pass gain fiber 218. When formed using a single-pass gain fiber 218, an angle capillary tube 222 is positioned at the end of the gain fiber 218 to prevent light from being reflected back into the fiber 218. When formed as a double-pass broadband fiber source, angle capillary tube 222 is replaced with a reflector to reflect the forward light back into gain fiber 218. Reflector 222 is preferably formed as a dichroic mirror, but may be a Bragg or long period fiber grating or a straight cleave on the end of the gain fiber 218. The reflector 222 causes the light emitted in the forward direction to be reflected back in the reverse direction, so that both the reverse light and the forward light are directed to the WDM coupler 210. The pump light does not reflect from the reflector 222 when a dichroic mirror is used.

The gain fiber 218 emits the forward light and the reverse light. The forward light may be converted to reverse light, i.e., reflected back towards the WDM coupler 210. Michal (column 4, lines 60-65; FIG. 5) discloses:

> The WDM coupler 210 directs the light emitted from the gain fiber 218 to the fiber optic gyroscope 204 via optical fiber 224 that is connected to optical pigtail 213 via splice 226. The light that the optical fiber 224 guides away from the WDM coupler 210 is the optical signal for the fiber optic gyroscope 204.

The WDM coupler 210 guides the reverse light emitted from the gain fiber 218 to the optical component. Michal fails to disclose a long period Bragg grating that attenuates the reverse light directed towards the pump light source 206. The WDM coupler eliminates a need for the long period Bragg grating that attenuates the reverse light from the gain fiber 218 directed towards the pump light source 206.

Applicant respectfully submits that the Office Action's citations to Vengsarkar, Orthonos, Goldberg, and Michal do not teach or suggest the long period Bragg grating that attenuates the one or more output signals, as recited in applicant's independent claim 1.

Applicant notes that the splices disclosed by Michal (e.g., FIG. 5: splices 216, 220, 226, 234, 248, and 256) and Goldberg (e.g., FIG. 1: fusion splice 22) are for optically coupling only two optical components. Referring to FIG. 5 of Michal, splice 216 couples optical fiber 208 with pigtail 212, splice 220 couples pigtail 215 with gain fiber 218, and splice 226 couples pigtail 213 with optical fiber 224. Referring to FIG. 1 of Goldberg, the fusion splice 22 couples the light guiding section 1 with the double cladding gain fiber 6.

Since the optical splices disclosed by Michal and Goldberg couple only two optical components, applicant submits that the optical transmission system 50 of Vengsarkar (FIG. 5) employs a WDM coupler for a pigtail configuration to optically couple the three necessary optical components, i.e., the transmitter source 51, the pump source 56, and the long period spectral shaping device 57.

The pigtail configuration requires the use of the wavelength division multiplexer to couple the pump energy to the optical fiber 52 for transmission to the amplifier 54. So, 1) the pump source 56 is optically spliced with the wavelength division multiplexer; and 2) the wavelength division multiplexer is optically spliced with the long period spectral shaping device 57. The pump source 56 is not optically spliced with the long period spectral shaping device 57. Applicant's claimed invention recites: "a long period Bragg grating that is optically coupled with the light source via a first optical splice."

FIG. 5 of Michal shows another example of a pigtail configuration with a wavelength division multiplexer. Michal (column 4, lines 16-23) discloses:

> A WDM coupler 210 has optical pigtails 212-215 extending therefrom. The pigtail 212 is connected to optical fiber 208 via a splice 216, so that the pump light propagates from the pump light source 206 to the WDM coupler 210. The WDM coupler 210 guides the pump light into a gain fiber 218 that is

PAGE 14/16 * RCVD AT 11/21/2005 4:40:30 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/30 * DNIS:2738300 * CSID:312 346 2810 * DURATION (mm-ss):07-56

> connected end-to-end with the optical fiber pigtail 215 via a splice 220.

Michal (column 4, lines 60-65) further discloses:

> The WDM coupler 210 directs the light emitted from the gain fiber 218 to the fiber optic gyroscope 204 via optical fiber 224 that is connected to optical pigtail 213 via splice 226. The light that the optical fiber 224 guides away from the WDM coupler 210 is the optical signal for the fiber optic gyroscope 204.

So, Michal discloses 1) the light source 206 is optically spliced (via splice 216) to the WDM coupler 210; and 2) the WDM coupler 210 is optically spliced (via splice 220) to the gain fiber 218. The pump light source 206 is not optically spliced with a long period Bragg grating. Applicant's claimed invention recites: "a long period Bragg grating that is optically coupled with the light source via a first optical splice."

For all the reasons presented above with reference to claim 1, claim 20 is believed neither anticipated nor obvious over the art of record. The corresponding dependent claims are believed allowable for the same reasons as independent claim 1, as well as for their own additional characterizations.

Withdrawal of the § 103 rejections is therefore respectfully requested.

In view of the above amendments and remarks, allowance of all claims pending is respectfully requested. If a telephone conference would be of assistance in advancing the prosecution of this application, the Examiner is invited to call applicant's attorney.

Respectfully submitted,

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